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PRODUCTION RATES OF ^{14}C AND ^{10}BE IN VACA MUERTA (MESOSIDERITE), CARANCAS AND SOME RECENT FALLS

A. J. T. Jull[1], M. D. Giscard[1], L. R. McHargue[1], K. J. Kim[2] and, R. C. Reedy[3]. [1]NSF-Arizona AMS Laboratory, University of Arizona, Tucson, AZ 85721, USA. [2]KIGAM, Daejeon, 305-350, Korea. [3]Planetary Science Institute, Tucson, AZ 85719, USA. E-mail: jull@email.arizona.edu.

Introduction: It is important to better understand the production rates of ^{14}C and other cosmogenic radionuclides, so that we better estimate ^{14}C terrestrial ages and ^{10}Be exposure ages.

Meteorites Studied: We analyzed the composition and the amount of ^{14}C and ^{10}Be of 7 samples taken at different depth within the piece number 10 of the mesosiderite Vaca Muerta recovered by Wasson et al. [1]. This is a reinvestigation of some earlier work reported in 1993 [2]. Furthermore, we have also measured the amount of ^{14}C in 6 falls: Carancas, Knyahinya, Nuevo Mercurio, Saratov, Tamdakht (all ordinary chondrites) and the diogenite Tatahouine. Tamdakht and Carancas are recent falls, with less than half a kg of material recovered for Carancas [3], although this seems discrepant from the reports of the crater at this location, implying an impactor of 1.5 to 15 tons [4].

Saturated Activities: ^{14}C measurements on falls range from 43.3 ± 1.3 dpm/kg and 56.9 ± 1.5 dpm/kg, and show good agreements with the measurements done on Bruderheim and other recent falls. The results are within ±15% error in saturated activity calculated previously by Jull et al. [5, 6], which arises from the uncertainty in sample position within the meteoroid.

Vaca Muerta: Elemental concentrations of oxides in Vaca Muerta have been analyzed by ICP-OES at the X-Ray Assay Laboratory of Don Mills, Ontario. ^{14}C and ^{10}Be measurements were performed at the NSF-Arizona AMS Laboratory, University of Arizona [5].The amount of ^{14}C in the Vaca Muerta samples range between 43.9 ± 1.3 dpm/kg and 20.7 ± 1.7 dpm/kg in the bulk samples. One sample from the surface of the meteorite, which silicate and iron phase have been separated by crushing and separation by a hand-magnet, gave a value of 7.6 ± 0.7 dpm/kg for the iron phase and 32.8 ± 1.5 dpm/kg for the silicates. We estimate that Vaca Muerta's terrestrial age is <2000 years. ^{14}C coupled with ^{10}Be results will allow us to study the production rate as a function of depth and refine our estimate of the age.

Carancas: Carancas has a higher ^{14}C value of 56.9 ± 1.5 dpm/kg, which is higher than expected for an H chondrite. We measured a value for ^{10}Be of 17.3 ± 0.2 dpm/kg, resulting in $^{14}C/^{10}Be = 3.3 \pm 0.1$. These data are not inconsistent with an object with a radius of ~50–75 cm, and in agreement with the mass estimate of [4].

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FRACTIONATION OF MG ISOTOPES BETWEEN THE SUN'S PHOTOSPHERE AND THE SOLAR WIND

A. J. G. Jurewicz, [1] R. Hervig [1], D. S. Burnett[2], R. Wiens[3], M. Wadhwa [1], and K. Rieck[1]. [1]Arizona State University, Tempe AZ. [2]Caltech, Pasadena CA. [3]LANL, Los Alamos NM. E-mail: Amy.Jurewicz@asu.edu.

Introduction: The Genesis mission goal is to precisely determine the elemental and isotopic composition of the solar photosphere through measurements of solar wind; the photospheric composition being a proxy for the early solar nebula. So, how elements and isotopes are fractionated (or not) when accelerated out of the photosphere is fundamental to interpreting Genesis data.

Other studies indicate that light elements and isotopes of noble gases fractionate when accelerated out of the photosphere [eg.,1, 2]. Lithophile elements have low First Ionization Potentials (FIP < = 9) and First Ionization Times (FIT). So, if FIP and/or FIT dominate formation of solar wind, there may be minimal fractionation of these cosmochemically-interesting elements and their isotopes. Conversely, if other mechanisms predominate this apparent lack of fractionation may reflect insufficient resolution of spacecraft data.

Coulomb drag is an alternate mechanism to FIP or FIT which predicts measurable fractionation in Mg isotopes from the photosphere. There is some evidence for this fractionation at the 1-sigma level, in data from in situ solar-wind instruments [3].

Solar Mg isotopic abundances are well constrained from cosmochemical studies and the high expected fluence of Mg in Genesis array materials (~2E12/cm^2) makes Mg isotopes in Genesis-flown samples feasible. This abstract presents preliminary results on Mg fractionation during formation of solar wind.

Experimental: ^{24}Mg and ^{26}Mg were implanted (~10:1) into flight-spare Genesis diamond-like carbon (dlc) and silicon (si). The isotopic ratio was validated using MC-ICPMS; remaining implant material was used to determine the instrumental fractionation for individual SIMS measurements. Preliminary measurements on two flight samples, 60065 (dlc) and 60289 (si) show that all three isotopes of Mg are easily measured using 60% DTOS *[4]* on a (250 μm)^2 rastered area. 60065 gave clean profiles, the MgH interference was insignificant, and the SIMS calibration well constrained. Because heavy and light isotopes have different depth distributions, isotopic ratios were calculated using the integrated counts for each profile. For 60289, profiles of all Mg isotopes could be measured, deconvolved from surface contamination, and seemed heavy. However, we need to validate that the ^{24}MgH interference was resolved, and to understand a persistent Mg background signal (both standard and unknown) perhaps related to using DTOS with an O2 flood (avoid issues with transient sputtering). Accordingly, 60289 is being reanalyzed, and the conclusions here are based on preliminary 60065, dlc-data.

Results: Preliminary data from 60065 are non-chondritic outside of analytical error, suggesting that Mg isotopes are fractionated from the solar. Moreover, the direction and magnitude of the deviation are consistent with predictions of Coulomb drag and with in situ spacecraft evidence for isotopic fractionation. Detailed results will be given at the conference.

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